wherein R is selected from the group consisting of hydrogen, a C_1-C_{20} straight chain hydrocarbon, a C_1-C_{20} branched hydrocarbon and an aromatic group;

the process comprising:

purifying a Cu^{2+} solution by adding an oxidizing agent and H_3PO_4 to the solution, and raising the pH of the solution.

REMARKS

Claims 1 and 9 have been amended to recite that R can be hydrogen, a C_1 - C_{20} straight chain hydrocarbon, a C_1 - C_{20} branched hydrocarbon or an aromatic group. No question of new matter arises and entry of the amendments is respectfully requested. Moreover, Applicants submit that these amendments are proper despite the finality of the Office Action because they place the application in condition for allowance and/or place the claims in better form for appeal.

Claims 1 - 17, 19, 21, and 23 - 25 are before the Examiner for consideration.

Objection to Claims 19 and 21

On page 2 of the Office Action, claims 19 and 21 have been objected to as not immediately following the claim from which it depends. To facilitate prosecution of this application, Applicants have canceled claims 18, 20, and 22. By canceling claims 18, 20, and 22, claims 19 and 21 immediately follow the claims from which they depend. Therefore, reconsideration and withdrawal of this objection is respectfully requested.

Rejection under 35 U.S.C. §112, first paragraph

Claims 1 – 18 and 23 have been rejected under 35 U.S.C. §112, first paragraph, for lack of enablement. In particular, the Examiner rejects Applicants' arguments and again asserts that the specification does not provide enablement for anions in general because there is only a limited number of working examples of anion "A" and none of anion "B". The Examiner further asserts that the prior art indicates that not all copper salts will produce colloidal copper. As such, the Examiner concludes that one of ordinary skill in the art would be required to conduct undue experimentation to determine what anions would be suitable either in combination with "A" anions or alone.

Applicants respectfully traverse this rejection in view of the following remarks.

It is a basic problem in chemistry to properly and accurately describe a molecule with a single chemical formula. Some molecules, such as ethylene, can be described in a straightforward manner with a single formula. For example, ethylene is expressed as C_2H_4, its dimer is expressed as C_4H_8 (e.g., 2-butene), its trimer is expressed as C_6H_{12}, and its n-mer is expressed as $(C_2H_4)_n$. There are no other formulas to describe these molecules. On the other hand, some molecules and/or compounds are expressed with a simplified chemical equation. One such example is table salt, commonly expressed by the formula NaCl. However, table salt does not exist in such a monomeric form. In reality, it is a polymer that forms a crystal lattice. Thus, the formula $(NaCl)_{\underline{4}}$ is the formula that accurately describes the true form of table salt.

Many other ionic inorganic compounds fall within the same category as NaCl, i.e., they are described with chemical formulas that do not represent their true polymeric form.

Examples of such ionic inorganic compounds include copper (II) (e.g., cupric) compounds such as cupric chloride ($CuCl_2$), cupric sulfate pentahydrate ($CuSO_4{\bullet}5H_2O$), and cupric hydroxide ($Cu(OH)_2$). These copper compounds are polymeric; however, they are represented by monomeric formulas. In addition, ionic inorganic compounds are typically expressed by the simplest natural number, if possible, for simplicity.

The claimed cupric compound represented by CuAxBy inherently suffers from these above-described chemical "problems". As with NaCl, which implicitly includes the formula $(NaCl)_{\underline{4}}$, the monomeric formula CuAxBy implicitly includes compounds described by the polymeric formula $(CuAxBy)_n$, where n = 1, 2, 3, 4.... Thus, the formula CuA_xB_y, where mx + ny = 2, is identical to the formula, $Cu_zA_xB_y$, where mx + ny = 2z. Using cupric citrate as an example, $Cu_2(OH)$citrate is the same as $Cu(OH)_{1/2}(citrate)_{1/2}$. Thus, $Cu_2(OH)$citrate can be expressed in the form of the claimed formula CuA_xB_y, where A = (OH), x = ½, B = citrate, and y = ½. It follows that in this monomeric formula, mx + ny = 2 equals (1)(1/2) + (3)(1/2) = 2. Thus, Example 8 provides at least one example of anion "B" that falls within the scope of the claims.

In addition, Applicants submit that the identification of anions that would be suitable either in combination with "A" anions or alone can be performed without undue or unreasonable experimentation. The process of identifying the possible anions that can be used is not a particularly difficult or time consuming process. In fact, such identification processes are commonly and routinely performed by those of skill in the art in the field.

It is well established that a considerable amount of experimentation is permissible, if it is merely routine, or if the specification provides a reasonable amount of guidance with

respect to the direction in which the experimentation should proceed. In re Wands, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). Moreover, even if such experimentation is complex, it does not necessarily make it undue, if the art typically engages in such experimentation. In re Certain Limited-Charge Cell Culture Microcarriers, 221 U.S.P.Q. 1165, 1174 (Int'l Trade Comm'n 1983), Massachusetts Institute of Technology v. A.B. Fortia, 774 F.2d 1104 (Fed. Cir. 1985). The ease in carrying out experiments to achieve the identification of the species of anions capable of producing colloidal copper is a factor that favors the enablement of the claimed process and composition. Time and difficulty of experimentation are not determinative if they are merely routine.

In view of the above, Applicants respectfully submit that the present invention is sufficiently enabled and respectfully request that this rejection be reconsidered and withdrawn.

Rejection under 35 U.S.C. §112, first paragraph

Claims 1 – 18 and 23 have been rejected under 35 U.S.C. §112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that Applicants had possession of the claimed invention. Specifically, the Examiner asserts that the specification supports that the $C_1 - C_{20}$ straight or branched chain hydrocarbons and aromatic groups are variations of the variable "R" and not anions. As such, the Examiner concludes that the amendment submitted on September 23, 2002 constitutes new matter.

In response, Applicants have amended claims 1 and 9 to recite that R is selected from the group consisting of hydrogen, a C_1 - C_{20} straight chain hydrocarbon, a C_1 - C_{20} branched hydrocarbon and an aromatic group and that anion A is selected from the group consisting of Cl^-, Br^-, I^-, F^-, NO_3^- SO_4^{2-}, PO_4^{3-}, OH, $RCOO^-$, tartrate^{2-}, citrate^{3-} and an amino acid residue. Applicants submit that as amended, the claims accurately describe the claimed invention and that no new matter has been introduced. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

Rejection under 35 U.S.C. §112, second paragraph

Claims 1 – 25 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite. In particular, the Examiner asserts that two of the claimed anions (i.e., phosphate and citrate) do not fall within the scope of the claims because they have oxidation numbers of 3 and the claims recite that the colloidal cupric compound has a formula of CuAxBy, where A and B are anions, $0 \leq x \leq 2$, $0 < y \leq 2$, and $mx + ny = 2$. In addition, the Examiner notes that

the colloidal copper citrate in the specification is represented by $Cu_2(OH)$citrate. The Examiner asserts that the formula has no coefficient associated with "Cu" and concludes that there is only a single copper.

As described above, although ionic inorganic compounds such as copper (II) (e.g., cupric) compounds are polymeric, they are represented with monomeric formulas. In addition, these ionic inorganic compounds are typically expressed by the simplest natural number for simplicity. The claimed cupric compound represented by CuAxBy inherently suffers from these chemical "problems". As explained above with reference to NaCl, the monomeric formula CuAxBy includes compounds described by the polymeric formula $(CuAxBy)_n$, where n = 1, 2, 3, 4.... Thus, the formula CuA_xB_y, where mx + ny = 2, is identical to the formula $Cu_zA_xB_y$, where mx + ny = 2z. Using cupric citrate as an example, $Cu_2(OH)$citrate is the same as $Cu(OH)_{1/2}(\text{citrate})_{1/2}$. Thus, $Cu_2(OH)$citrate can be expressed in the form of the claimed formula, CuA_xB_y, where A = (OH), x = ½ , B = citrate, and y = ½. It follows that in this monomeric formula, mx + ny = 2 equals (1)(1/2) + (3)(1/2) = 2. The same result would be obtained if citrate (oxidation number of 3) was replaced with phosphate (oxidation number of 3), or with any compound having an oxidation number of 3.

In addition, Applicants submit that there are numerous examples in the Merck Index of copper compounds, such as are described herein, which can be expressed with different formulas. For example, several examples are given on page 2691 of the 13th edition of the Merck Index, including:

$2Cu(CH_3COO)_22ACu(OH)_2{\bullet}5H_2O = Cu_3(OH)_2(CH_3COO)_4{\bullet}5H_2O$

$Cu(CH_3COO)_2XCu(OH)_2{\bullet}5H_2O=Cu_2(OH)_2(CH_3COO)_2{\bullet}5H_2O$

$Cu(CH_3COO)_2X2Cu(OH)_2=Cu_3(OH)_4(CH_3COO)_4$

$Cu(CH_3COO)_2X3Cu(OH)_2•H_2O=Cu_4(OH)_6(CH_3COO)_2•2H_2O$.

Further, Applicants submit that there are several compounds that include more than one copper. For example, on pages 2723 and 2697 of the 13th edition of the Merck Index, compounds such as $Cu_4(OH)_6SO_4$, $Cu_3(OH)_2SO_4$,$Cu_2(OH)_2CO_3$, and $Cu_3(OH)_2(CO_3)_2$ are listed, each of which contains more than one copper.

In view of the above, Applicants submit that the claims and specification are sufficiently definite and respectfully request that the Examiner reconsider and withdraw this rejection.

Rejection under 35 U.S.C. §112, second paragraph

Claims 1, 6 – 10, and 14 – 25 have been rejected under 35 U.S.C. §112, second paragraph, as being incomplete for omitting essential steps. In particular, the Examiner asserts that the purifying step in the amended claims does not appear to remove any impurities or otherwise separate the substance from the impurities because the specification indicates that after the oxidizing agent and H_3PO_4 are added, the pH is adjusted to 3, the solution is heated, and the solid precipitate is removed by filtration. The Examiner notes MPEP §2172.01.

According to MPEP §2172.01, a claim that omits matter disclosed to be essential to the invention as described in the specification and which is necessary to practice the invention can be properly rejected under U.S.C. §112, second paragraph. However, Applicants submit that the steps of adjusting the pH to 3, heating the solution, and removing the solid precipitate

by filtration are merely an example of how to further purify the copper solution and are not essential and necessary steps to practice the claimed invention.

On page 10 of the application, in paragraph [0043], it states that the starting cupric solution is purified to remove impurities such as ferrous, ferric, and aluminum ions by adding phosphoric acid or phosphate ions. In addition, if ferrous ions or other reduced species are present in the solution, they are oxidized by using an oxidizing agent such as hydrogen peroxide, hypocholorite ions, bleach, or ozone injection. (*Id.*) It is only in Example 1 that the steps of adjusting the pH to 3, heating the solution, and removing the solid precipitate by filtration are disclosed as an example of how to further purify the solution. Therefore, Applicants respectfully submit that these steps are not required to be present in the independent claims, and are properly located in dependent claims 3 and 11 as possible (e.g., exemplary) steps for further purification of the copper solution. Moreover, as indicated in the MPEP at §2111.03, the transitional term "comprising" as used in claims 1 and 9 is open-ended and does not necessarily exclude the additional purification steps recited in claims 3 and 11.

In view of the above, Applicants submit that independent claims 1 and 9 include the necessary and essential steps and respectfully request that the Examiner reconsider and withdraw this rejection.

Rejection under 35 U.S.C. §102(b)/103(a)

The Examiner has rejected claims 1 – 8 under 35 U.S.C. §102(b)/103(a) as being anticipated by, or in the alternative, obvious over Brasch (U.S. Patent No. 4,681,630), claims

1 – 8, 17, 18, and 23 under 35 U.S.C. §102(b)/103(a) as being anticipated by, or in the alternative, obvious over WO 96/10918, claims 1 – 8 and 17 – 25 under 35 U.S.C. §102(b)/103(a) as being anticipated by, or in the alternative, obvious over Casale (Abstract), and claims 1 – 8 under 35 U.S.C. §102(b)/103(a) as being anticipated by, or in the alternative, obvious over Paal et al. (Abstract) or Bannigan, Jr. (U.S. Patent No. 4,253,843). In particular, the Examiner asserts that each of the cited references teach a colloidal cupric compound of the present invention.

Applicants respectfully traverse this rejection in view of the following remarks.

The term "colloid" as used in copper compounds is conventionally used to express a state in which the copper compound is hung in solution and does not immediately precipitate. In conventional colloidal copper compounds, the copper compound separates from the solution. For example, some colloidal copper compounds separate from the solution within hours and some copper compounds take days to separate. However, by the time consumers receive the "colloid" solution, the solution has separated to a clear supernatant and a sedimented solid on the bottom. As a result, the consumers have to shake the product before each use.

On the other hand, colloidal cupric compounds according to the present invention do not fall out of solution and separate into a supernatant and cupric precipitate. Thus, the inventive colloidal cupric compounds demonstrate unexpectedly superior stability. In this regard, Applicants respectfully direct the Examiner's attention the unexecuted Declaration

under 37 CFR § 1.132[1] attached hereto, and more specifically to Appendix A, which is a photograph of the gel electrophoresis of cupric tartarate (0.01M) at pH 8 and buffered by 0.05 M tartaric acid and NaOH. In this experiment, the cupric ion was localized by reacting it with ferricyanide ions, thereby forming an insoluble coffee colored complex. It is respectfully submitted that copper tartarate in aqueous solution forms numerous chemical species having the common formula $Cu(tartarate^{2+})(OH)_y$ and that copper tartarate falls within the scope of the present claims.

In electrophoresis, if a soluble cupric ion exists, the ion will remain at the origin. As seen in Appendix A, there are no cupric ions located at the origin. Moreover, the cupric ions are located in the middle of the gel and are visible as a wide spot. Therefore, the copper ions in the cupric tartarate are colloidal and stable. Appendix B, which is a particle size diagram of cupric tartarate obtained by dynamic small angle X-ray diffraction[2], shows that the cupric tartarate includes two different particle sizes, 130 nm and 3800 nm.

In view of the above, Applicants submit that the present invention is unexpectedly stable and is not anticipated by, or obvious over, the cited references for at least this reason and respectfully request that the Examiner reconsider and withdraw these rejections.

[1] An executed copy of the Declaration under 37 C.F.R. §1.132 will be submitted as soon as it is received by Applicants attorney.

[2] Experimentation was conducted by Prof. Makoto Tadokoro, Department of Chemistry, Osaka City University, Osaka, Japan.

CONCLUSION

In light of the above, Applicants believe that this application is now in condition for allowance and therefore request favorable consideration.

If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

HARNESS, DICKEY, & PIERCE, P.L.C.

By ______________________

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MARKED-UP COPY OF AMENDED CLAIMS

1. (Twice Amended) A colloidal cupric compound of formula (I):

$$CuAxBy \qquad (I)$$

wherein A and B are anions,

$0 \leq x \leq 2$,

$0 < y \leq 2$,

[wherein R is selected from the group consisting of hydrogen and an aromatic group, and]

$mx + ny = 2$;

wherein m and n are coefficients equal to oxidation numbers of the anion A and B, respectively,

the anion A is selected from the group consisting of Cl^-, Br^-, I^-, F^-, NO_3^- SO_4^{2-}, PO_4^{3-}, OH, $RCOO^-$, [a C_1-C_{20} straight chain hydrocarbon, a C_1-C_{20} branched hydrocarbon, an aromatic group,] tartrate^{2-}, citrate^{3-} and an amino acid residue;

<u>wherein R is selected from the group consisting of hydrogen, a C_1-C_{20} straight chain hydrocarbon, a C_1-C_{20} branched hydrocarbon and an aromatic group,</u>

the colloidal cupric compound made by a process comprising the steps of:

purifying a Cu^{2+} solution by adding an oxidizing agent and H_3PO_4 to the solution[;], and

raising the pH of the solution.

9. (Twice Amended) A process for producing a colloidal cupric compound of formula (I):

CuAxBy (I)

wherein A and B are anions,

$0 \leq x \leq 2$,

0 [$\leq$] $\leq y \leq 2$, and

$mx + ny = 2$[,];

wherein m and n are coefficients equal to oxidation numbers of the anion A and B, respectively,

the anion A is selected from the group consisting of Cl^-, Br^-, I^-, F^-, NO_3^- SO_4^{2-}, PO_4^{3-}, <u>OH,</u> $RCOO^-$, [a C_1-C_{20} straight chain, a C_1-C_{20} branched hydrocarbon, an aromatic group,] tartrate^{2-}, citrate^{3-} and an amino acid residue;

wherein R is selected from the group consisting of hydrogen<u>, a C_1-C_{20} straight chain hydrocarbon, a C_1-C_{20} branched hydrocarbon</u> and an aromatic group;

the process comprising:

purifying a Cu^{2+} solution by adding an oxidizing agent and H_3PO_4 to the solution[;],

and

raising the pH of the solution.